



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,113	08/01/2003	Maki Ito	Q76707	3482

23373 7590 06/22/2006

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

MRUK, GEOFFREY S

ART UNIT	PAPER NUMBER
----------	--------------

2853

DATE MAILED: 06/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/632,113

Applicant(s)

ITO, MAKI

Examiner

Geoffrey Mruk

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 15 May 2006 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 2, and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US 6,256,849 B1) in view of Mukoyama (JP 404257446 A) and Hashizume et al. (US 6,142,614).

With respect to claim 1, the primary reference Kim discloses a liquid-jet head (Column 1, line 7) comprising:

- a passage-forming substrate (Fig. 15, elements 1, 7-9) on which pressure generating chambers (Fig. 15, element 1a) communicating with nozzle orifices (Fig. 15, element 10) are defined, and

Art Unit: 2853

- a piezoelectric element (Column 1, lines 18-21)) composed of a lower electrode (Fig. 15, element 3), a piezoelectric layer (Fig. 15, element 4) and an upper electrode (Fig. 15, element 5), which are provided on the passage-forming substrate while interposing a vibration plate (Fig. 15, element 2) there between, wherein,
- the lower electrode (Fig 15, element 3) is provided to extend from an area facing the pressure generating chamber (Fig. 15, element 1a) to an area facing compartment walls (Fig. 15, array of element 1) which are present on both sides, in a width direction, of the pressure generating chambers,
- a cross section of the piezoelectric layer, when cut along the width direction, has a trapezoidal shape, both ends, in a width direction, of the piezoelectric layer at a pressure generating chamber side are positioned in a region facing the pressure generating chamber (Column 9, lines 10-14).

With respect to claim 4, the primary reference Kim discloses the pressure generating chambers (Fig. 15, element 1) are formed in a single crystal silicon substrate by anisotropic etching (Column 6, lines 36-38; Column 13, lines 58-67; Column 14, lines 1-4), and each layer of the piezoelectric element (Fig. 15, element 4) is formed by deposition and a lithography method (Column 14, lines 5-23).

With respect to claim 5, the primary reference Kim discloses the liquid-jet head (Column 1, line 7) according to any one of claims 1 to 4.

With respect to claim 6, the primary reference Kim discloses the lower electrode (Fig 15, element 3) extends beyond an area facing the pressure generating (Fig. 15, element

1a) chamber to an area facing compartment walls (Fig. 15, array of element 1), which are present on both sides, in a width direction, of the pressure generating chamber.

However, the primary reference of Kim fails to disclose:

- with respect to claim 1, the lower electrode comprising at least a titanium layer, an iridium layer, and a platinum layer,
- with respect to claim 1, a relationship between a width x of a portion of the piezoelectric layer provided on a lower electrode, the portion of the piezoelectric layer being located directly facing the lower electrode and at the pressure generating chamber side, and a width y of the pressure generating chamber at the vibration plate side satisfies $0.75 \leq x/y \leq 1$ and
- with respect to claim 2, the width x of the piezoelectric layer at the pressure generating chamber side and the width y of the pressure generating chamber at the vibration plate side are equal.

The secondary reference Mukoyama discloses an ink jet recorder where "The ratio of the width of the piezoelectric crystal element 30 to that of the pressure chamber 20 is within a range from 0.8 to 1.0" (English Abstract) and the width of the pressure generating chamber at the vibration plate side are equal (Fig. 3 and the range disclosed in the English Abstract).

The tertiary reference Hashizume discloses an ink-jet recording head using an actuator with a piezo-electric element where "The lower electrode 61 employs a five-layered structure comprising a nickel film 51, a titanium film 52, a titanium oxide film 53 and a titanium film 54 and a platinum film 55 which are arranged in order from the

Art Unit: 2853

silicon oxide film 12 side" (Column 16, lines 24-27) and "Although the five-layered structure has been used for the lower electrode 61 according to Embodiment 13 of the present invention, the multilayer structure is not limited to what has been mentioned in this embodiment thereof but may be such that any other conductive material such as zirconia, iridium, titanium-zirconia alloy, iridium-titanium alloy and so on is used for the purpose on condition that the lowermost layer (layer close to the silicon substrate) is formed of the is nickel film" (Column 16, lines 46-54).

At the time of the invention, it would have been obvious for one of ordinary skill in the art to use the ratio disclosed by the secondary reference of Mukoyama and furthermore the lower electrode disclosed by the tertiary reference of Hashizume in the inkjet head of Kim. The motivation for doing so would have been "so that ink drops are efficiently spouted" (English Abstract of Mukoyama) and "Consequently, it is possible to provide a reliable piezo-electric element and an ink-jet recording head using the same" (Column 17, lines 30-32 of Hashizume).

The examiner makes of record the interpretation of the shape of the piezoelectric crystal element 30 and the pressure chamber 20 in the Mukoyama reference to be rectangular, making the opposite sides of each respective element equal.

2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US 6,256,849 B1) in view of Mukoyama (JP 404257446 A) and Hashizume et al. (US 6,142,614) as applied to claim 1 above, and further in view of Hashizume (JP 410286960 A).

Kim, Mukoyama, and Hashizume references disclose all of the limitations of the liquid-jet head except the pressure generating chamber has a space portion, the space being provided at a periphery of an opening of the pressure generating chamber at the vibration plate side.

The quaternary reference Hashizume discloses the pressure generating chamber (Fig. 1, element 20) has a space portion (Fig. 1, element 8), the space being provided at a periphery of an opening of the pressure generating chamber at the vibration plate side (paragraph 0028).

At the time of the invention, it would have been obvious for one of ordinary skill in the art to use the space portion disclosed by the quaternary reference of Hashizume in the inkjet head of Kim. The motivation for doing so would have been "a high speed and the regurgitation of the ink held in the ink cavity 20 can be carried out in large quantities. Moreover, since the side attachment wall 8 has a taper structure, it can also prevent that distortion arises in the single crystal silicon substrate¹" (paragraph 0029).

Response to Arguments

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is 571 272-2810. The examiner can normally be reached on 7am - 330pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GSM
6/16/2006

GM


STEPHEN MEIER
SUPERVISORY PATENT EXAMINER